

Application No. 10/804,477
Amendment and Response

AMENDMENTS TO THE CLAIMS

The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

Claims 1-20 (cancelled)

20. (new) A diode on a silicon substrate, comprising:

an active region in the silicon substrate, the active region being heavily doped with a first type dopant;

a refractory metal silicide layer contacting and covering at least a portion of the active region;

an insulation layer contacting and covering at least a portion of the first refractory metal silicide layer, the insulation layer having a diode opening extending therethrough and communicating with the first refractory metal silicide layer;

a polysilicon plug disposed within the diode opening and contacting the first refractory metal silicide layer, the polysilicon plug comprising:

a bottom portion in contact with the first refractory metal silicide layer and being lightly doped with the first conductivity type dopant, and

a top portion in contact with the bottom portion; and

a material that is capable of changing states and resistivities vertically over and in communication with the polysilicon plug.

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21. (new) A diode as defined in claim 20, wherein the material that is capable of changing states and resistivities comprises a programmable resistor, the diode further comprising a metal contact vertically over and in communication with the programmable resistor.

22. (new) A diode as recited in claim 21, wherein the programmable resistor comprises at least one layer comprised of a memory material selected from the group consisting of ovonic and chalcogenide materials.

23. (new) A diode as defined in claim 21, wherein the programmable resistor further comprises at least one barrier layer.

24. (new) A diode as defined in claim 23, wherein said barrier layer comprises titanium nitride.

25. (new) A diode as defined in claim 20, wherein the diode opening has a width in a range between about 0.3 microns to about 0.8 microns.

26. (new) A diode as defined in claim 20, further comprising a continuous second refractory metal silicide layer positioned between the polysilicon plug and the first refractory metal silicide layer and also between the polysilicon plug and the insulation layer.

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27. (new) A diode as defined in claim 26, wherein the second refractory metal silicide layer is made of a refractory metal silicide selected from a group consisting of: titanium silicide, tungsten silicide, tantalum silicide, cobalt silicide, and molybdenum silicide.

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28. (new) A diode on a silicon substrate, comprising:
- a silicon substrate lightly doped with a first conductivity type dopant;
 - an oxide layer overlaying the silicon substrate, the oxide layer having a top surface and defining a hole which extends through the oxide layer and communicates with a portion of the silicon substrate;
 - a polysilicon plug positioned within the hole in the oxide layer, the polysilicon plug being doped with a second conductivity type dopant opposite the first conductivity type dopant;
 - an active region formed in the silicon substrate below the polysilicon plug, the active region being doped with the second conductivity type dopant received from the polysilicon plug; and
 - a material that is capable of changing states and resistivities vertically over and in communication with the polysilicon plug.

29. (new) A diode as defined in claim 28, wherein the oxide layer defines a channel that extends from the top surface of the oxide layer to the top surface of the polysilicon plug, the polysilicon plug having a top surface that is below the top surface of the oxide layer.

30. (new) A diode as defined in claim 28, wherein the polysilicon plug is at least partially encased by the oxide layer;

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31. (new) A diode as defined in claim 28, wherein the material that is capable of changing states and resistivities comprises a programmable resistor, the diode further comprising a metal contact vertically over and in communication with the programmable resistor.

32. (new) A diode as recited in claim 31, wherein the programmable resistor comprises at least one layer comprised of a memory material selected from the group consisting of ovonic and chalcogenide materials.

33. (new) A diode as recited in claim 31, wherein the programmable resistor further comprises at least one barrier layer formed of titanium nitride.

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34. (new) A diode on a silicon wafer, comprising:
- an active region in a silicon wafer, the active region being heavily doped with a first conductivity type dopant;
 - a first refractory metal silicide layer contacting and covering at least a portion of the active region;
 - an insulation layer contacting and covering at least a portion of the first refractory metal silicide layer, the insulation layer having a diode opening defined by an interior surface extending through the insulation layer and communicating with the first refractory metal silicide layer;
 - a second refractory metal silicide layer lining the interior surface of the diode opening so as to contact the first refractory metal silicide layer;
 - a polysilicon plug within the diode opening, the polysilicon plug being lightly doped with the first conductivity type dopant;
 - a platinum silicide layer contacting the polysilicon plug and separated from the second refractory metal silicide layer;
 - an insulative silicon layer overlying the diode opening, the insulative silicon layer having a passageway extending therethrough and communicating with the platinum silicide layer; and
 - a layer of a material that is capable of changing states and resistivities material over the insulative silicon layer, within the passageway, and contacting the platinum silicide layer.

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35. (new) A diode as defined in claim 34, further comprising:
a metal contact in contact with the material that is capable of changing states and resistivities.
36. (new) A diode as defined in claim 34, wherein the material that is capable of changing states and resistivities comprises a programmable resistor.
37. (new) A diode as recited in claim 36, wherein the programmable resistor comprises at least one layer comprised of a memory material selected from the group consisting of ovonic and chalcogenide materials.
38. (new) A diode as defined in claim 36, wherein the programmable resistor further comprises at least one barrier layer.
39. (new) A diode as defined in claim 38, wherein the barrier layer comprises titanium nitride.
40. (new) A diode as defined in claim 34, wherein the polysilicon plug comprises polysilicon having an average grain size diameter in a range between about 0.3 microns to about 0.8 microns.